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ABSTRACT

The primary purpose of this descriptive survey study was to compare the research priorities of preservice and inservice elementary teachers. Secondary purposes included (1) determining the research priorities of preservice elementary teachers; (2) investigating the differences in research priorities according to gender; (3) investigating the differences in research priorities of preservice elementary teachers according to grade level choice; and (4) investigating the differences in priorities of preservice elementary teachers according to the number of college science courses completed. The sample consisted of four sections of preservice elementary teachers enrolled in the course "Teaching Elementary Science Methods at a midwestern university with an enrollment of approximately 20,000. Of the sample, 80 teachers were female and 7 were male. The National Science Teachers Association Survey of Elementary Teachers on Research Interests was administered to the sample the first day of the semester. The questionnaire consisted of 28 Likert-type items focusing on science-related research topics and demographic questions. The data are reported in frequencies and percents. The data on the inservice teachers came from a previous study conducted by Gabel (1987). The significance of the study, purposes, population and sample, instrument, procedures, results, and conclusions are included. (Author/KR)

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# Research Interests: Comparison of Preservice and Inservice Elementary Teachers

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# RESEARCH INTERESTS: COMPARISON OF PRESERVICE AND INSERVICE ELEMENTARY TEACHERS


## Abstract

The primary purpose of this descriptive survey study was to compare the research priorities of preservice and inservice elementary teachers. Secondary purposes included (a) determining the research priorities of preservice elementary teachers, (b) investigating the differences in research priorities according to gender, (c) investigating the differences in research priorities of preservice elementary teachers according to grade level choice (i.e., K-4 or 5-8), and (d) investigating the differences in priorities of preservice elementary teachers according to the number of college science courses completed (i.e., 1-3 or 4-12). The review of literature focused on the role of research in science teaching and science education interests of inservice elementary teachers. The sample (N = 87) consisted of four sections of preservice elementary teachers enrolled in the course "Teaching Elementary Science Methods" at a midwestern university with an enrollment of approximately 20,000. Although only students currently enrolled in the elementary science methods course were included, the sample should be considered representative of elementary majors at this university. Of the sample, 80 teachers were female and seven were male. The National Science Teachers Association Survey of Elementary Teachers on Research Interests was administered to the

sample the first day of the semester. This questionnaire consists of 28 Likert-type items focusing on science-related research topics and eight demographic questions. The demographic questions were modified to fit the background of preservice elementary teachers. Student records were checked to verify the number of college science courses completed. The data are reported in frequencies and percents. The responses to the Likert-type items were dichotomized as "1" important (1's and 2's on the questionnaire) and "0" not important (3, 4, or 5 on the questionnaire), therefore allowing the comparison of the frequencies using Cochran's Q test. The McNemar was used for post hoc comparisons to determine differences between pairs of topics within the top ten chosen as important and within the lowest five selected as important. Seventy-nine percent desired to teach K-4 and 21% indicated grades above third. Sixty-four percent of the sample had completed three or less college science course; 36% had completed more than the required three science courses. In the analysis of the data for the preservice sample, the Cochran Q was significant at the .0001 level for the total sample, the female sub-sample, and the K-4 group. The McNemar was significant (a) for the sample in hands-on experiences and science content of the curriculum (b) for the sample in science fairs and sex differences, (c) for females in hands-on experiences and science content of the curriculum, and (d) for females in role models and science careers and sex differences. Preservice and inservice elementary teachers selected cognitive development and learning styles, hands-on

experiences, and problem solving as one of their top five research priorities. In addition to the above three topics, the preservice teachers rated slow learners, interdisciplinary teaching of science with mathematics and language arts, science learning centers, and disadvantaged children as highest research priorities. The inservice teachers identified sequencing of science content, barriers to teaching science, effective printed materials, and science classroom experiences and pupil attitudes as among the top research priorities. Consensus was found between the preservice and inservice teachers in their rating of role models and science careers, language difficulties, science fairs, misconceptions, and sex differences as lowest research priorities. Sex differences was the least preferred research topic for the preservice and inservice elementary teachers. The consensus in the importance of hands-on experiences, cognitive development and learning styles, and problem solving between the preservice and inservice elementary teachers was expected because of the emphasis upon these topics in preservice and inservice education. Overall, the preservice elementary teachers rated all research topics higher than the inservice elementary teachers. The question remains, Will their interest in these research topics challenge them to become active researchers?

## Significance of the Study

In "The NSTA Theme Paper on the Role of Research in Science Teaching" (Kyle, Bitner, Linn, Mitchener, & Perry, 1990), it is recommended that (a) research should be a collaborative effort of preschool through college teachers, (b) teachers should be actively engaged in research, (c) research should be conducted in classrooms, and (d) research should drive science education policy. A theme of NSTA is "Every Teacher a Researcher". Gabel et al. (1987) conducted a national survey of science education interests of inservice elementary teachers. In the review of the literature, no studies regarding science education interests of preservice elementary teachers were found; therefore, determining the science education research interests of preservice elementary teachers is warranted.

## Purposes of the Study

The purposes of this study were as follows:

1. to determine the research priorities of preservice elementary teachers;
2. to investigate the differences in research priorities of preservice elementary teachers according to gender;
3. to investigate the differences in research priorities of preservice elementary teachers according to grade level choice (i.e., K-4 or 5-8);
4. to investigate the differences in priorities of preservice elementary teachers according to the number of college science courses completed (i.e., 1-3 or 4-12); and

5. to compare the research priorities of preservice and inservice elementary teachers.

## Population and Sample

The sample (N = 87) consisted of preservice elementary teachers enrolled in the course "Teaching Elementary Science Methods" at a midwestern university with a student enrollment of approximately 20,000. Of the sample (N = 87), 80 subjects were female and seven were male.

At this university, elementary majors are required to complete at least three science courses. Students enrolled in the course "Teaching Elementary Science Methods" are either junior or senior undergraduate education students or teacher certification students. Of the 2,500 students enrolled in Teacher Education Program, approximately 1,200 are an elementary education major.

## Instrument

The National Science Teachers Association Survey of Elementary Teachers on Research Interests (Gabel et al., 1987) was used to collect the data. This questionnaire consists of 28 Likert-type items focusing on science related research topics and eight demographic questions. The demographic questions were modified to fit the background of preservice elementary teachers. The demographic information for the present study was limited to (a) gender, (b) grade level choice, and (c) number of college science courses completed. Student academic records were checked to verify the number of science courses completed.

## Procedures

The National Science Teachers Association Survey of Elementary Teachers on Research Interests was administered to the sample the first day of the course "Teaching Elementary Science Methods." Gabel et al.'s (1987) recommendations for data analysis were followed. The data are reported in frequencies and percents. The responses to the Likert-type items were dichotomized as "1" important (1's and 2's on the questionnaire) and "0" not important (3, 4, or 5 on the questionnaire), therefore, allowing the comparison of frequencies. The Cochran's Q test (SPSS-X User's Guide, 1988, pp. 744-745) was used to analyze the dichotomous data to determine whether all 28 research topics were of equal importance or whether there was a difference in preservice elementary teachers' perceptions of the importance of the research topics. The McNemar (SPSS-X User's Guide, 1988, pp. 741-742) was used for post hoc comparisons to determine differences between pairs of topics within the top ten chosen as important and within the lowest five selected as important.

## Results

The sample consisted of seven males (8%) and 80 (92%) females. Sixty-nine (79%) indicated they desire to teach grades K-4; 18 (20%) selected above fourth grade. The distribution of college science courses completed is reported in TABLE I. At this point of the Teacher Education Program, 64% of the sample had completed three or less science courses; 36% had

completed more than the required three science courses. Seven percent of the sample had completed eight to ten courses. Because one subject failed to answer all items on the questionnaire, only 86 subjects were included in the Cochran and McNemar analyses.

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Insert TABLE I about here

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Research Priorities of Preservice Elementary Teachers by Gender

For the sample (N = 86), the percentages selecting each of the 28 research topics as important ranged from 38% to 95% (see TABLE II). The top two research preference topics selected by 95% of the sample were cognitive development and learning styles (item 1) and hands-on experiences (item 3). The next eight in importance were slow learners (item 19), problem solving (item 11), gifted children (item 20), interdisciplinary teaching of science with mathematics and language arts (item 21), teaching strategies (item 12), science learning centers (item 8), disadvantaged children (item 26), and science content of the curriculum (item 4). Results similar to those for the total sample were found for the females. The males' research priorities differed somewhat from that of the total sample and females'. The six lowest research priorities (items 16 and 23 were both selected by 61% of the sample) were role models and science careers (item 16), science fairs (item 23), misconceptions (item 13), language difficulties (item 15), specialized science

teachers and facilities (item 5), and sex differences (item 24). The lowest preference topic for the total sample and each gender was sex differences. The Cochran was significant at the .0001 level for the total sample and for the sub-sample females, but not for the male sub-sample. When the McNemar was used to analyze differences among the top ten preferences and then among the lowest five preferences (only four for males) for the total sample and the two genders, only four significant differences were found.

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Insert TABLE II about here

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Research Priorities of Preservice Elementary Teachers According to Grade Category

Preservice elementary teachers in both grade categories (i.e., K-4 and 5-8) selected hands-on science and slow learners as one of the three top research priorities. Differences, however, existed between the two groups. The K-4 rated teaching strategies (item 12), science learning centers (item 8), and self-concept (item 18) among the top ten, whereas the 5-8 group included science content of the curriculum (item 4), balance of concept learning and process skills (item 6), sequencing of science content (item 14), and pre and inservice education programs (17) among their top research priorities. The Cochran was significant at the .0001 level for the K-4 group, but not for the 5-8 group. Of particular interest in the lowest preferences was the inclusion of

specialized science teachers and facilities (item 5) by the K-4 teachers. The McNemar indicated no significant differences among the highest preferences or among the lowest preferences.

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Insert TABLE III about here

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Research Priorities of Preservice Elementary Teachers According to Science Courses Completed

Hands-on science (3), cognitive development and learning styles (item 1), and slow learners (item 19) were the top research priorities for both groups (i.e., those with three or less courses and those with four to twelve courses). However, differences in their research priorities were found (see TABLE IV). The preservice teachers with three or less courses selected science learning centers (item 8), barriers to teaching science (item 27), self-concept (item 18), and disadvantaged children (item 26) among their top research priorities. Those with four or more college science courses selected contemporary topics (item 7), science content of the curriculum (item 4), and effective printed material (item 9) as top priorities. The Cochran was significant at the .0001 level for both groups. The teachers with four or more science courses rated printed materials as a high priority; the teachers with three or less courses rated it as a low preference. The McNemar indicated no significant differences among the highest research priorities or among the lowest

priorities.

Comparison of the Research Priorities of Preservice and Inservice Elementary Teachers

A comparison of the results of this study and Gabel et al. 's (1987) study of inservice elementary teachers (N = 553, usable questionnaires) indicates the following findings (see TABLE V). Both samples selected cognitive development and learning styles, hands-on experiences, and problem solving as one of the top five research priorities (see Fig. 1). The following differences, however, were found in the top research priorities for the two samples. The preservice teachers selected slow learners, interdisciplinary teaching of science with mathematics and language arts, science learning centers, and disadvantaged children as among the top research priorities; the inservice teachers chose sequencing of science content, barriers to teaching science, effective printed materials, and science classroom experiences and pupil attitudes as among the top research priorities. Consensus was found between the preservice and inservice teachers in their rating of role models and science careers, language difficulties, science fairs, misconceptions, and sex differences as lowest research priorities. In addition, the preservice teachers rated specialized science teachers and facilities as a low priority.

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Insert TABLE V about here

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The males in both samples selected cognitive development and learning styles, hands-on science, science classroom experiences and pupil attitudes, gifted children, and barriers to teaching science as their top research priorities. Differences in research priorities by gender were also found between the two samples. The male preservice teachers identified slow learners, rote versus meaningful learning, role model and science careers, self-concept, and interdisciplinary teaching of science with mathematics and language arts as top research priorities. The male inservice teachers rated problem solving, teaching strategies, science content of the curriculum, sequencing of science content, and specialized science teachers and facilities as top research priorities. Only minor differences were found in their lowest research priorities. Similarities in the female samples are their choice of hands-on science, cognitive development and learning styles, science content of the curriculum, and problem solving as top research priorities. In addition, the female inservice teachers selected barriers to teaching science, effective printed materials, sequencing the science curriculum, and science classroom experiences and pupil attitudes among the highest preferences. The female preservice teachers rated slow learners, interdisciplinary teaching of science with mathematics and language arts, disadvantaged children, science learning centers as top research priorities. The only differences in their lowest preferences were the preservice teachers' selection of specialized science teachers and facilities and the inservice teachers' choice of science fairs. Both

samples and gender sub-samples rated sex differences as the lowest research preference.

Gabel et al. (1987) reported that interest in cognitive development and learning styles and teaching strategies decreased as teachers became more experienced. Interdisciplinary teaching of science with mathematics and language arts was not a top research interest of teachers with more than five years of experience. They also found that less experienced teachers seemed less interested in problem solving than the more experienced teachers and more interested in sex differences than the more experienced teachers. Overall, the ratings of the preservice teachers were higher than the inservice teachers.

## Conclusions

Finding consensus in the importance of hands-on experiences, cognitive development and learning styles, and problem-solving between the samples was expected because of the emphasis upon these topics in preservice and inservice education. The selection of the other top research priorities by the preservice teachers is attributable at least in part to the focus of the preservice elementary program in this university. The preservice teachers are required to take a course in exceptionalities. The course emphasizes the handicapped. Of the inservice teachers, 47.2% had more than 16 years of teaching experience, and therefore would have begun teaching prior to P.L. 94-142. This could explain the inservice teachers' lack of interest in slow learners. In

the elementary methods and foundations courses in this university, an interdisciplinary approach to curriculum, problem solving, cognitive development and learning styles, hands-on experiences, and learning centers are emphasized. Perhaps the reality of teaching influenced the inservice teachers' other top research priorities.

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**Table I**

Demographics of Sample (n = 87)

| Category | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| Sample Size | 7 | 8 | 80 | 92 | 87 | 100 |
| Grade Level Desire to Teach | | | | | | |
| K | 0 | 0 | 9 | 11 | 9 | 11 |
| 1st or 2nd | 2 | 29 | 29 | 36 | 31 | 35 |
| 3rd or 4th | 2 | 29 | 27 | 34 | 29 | 33 |
| 5th or 6th | 2 | 29 | 13 | 16 | 15 | 17 |
| 7th or 8th | 1 | 14 | 2 | 2 | 3 | 4 |
| College Science Courses | | | | | | |
| 1 | 0 | 0 | 2 | 2 | 2 | 2 |
| 2 | 1 | 14 | 11 | 14 | 12 | 14 |
| 3 | 3 | 43 | 39 | 49 | 42 | 48 |
| 4 | 0 | 0 | 12 | 15 | 12 | 14 |
| 5 | 1 | 14 | 5 | 6 | 6 | 7 |
| 6 | 0 | 0 | 3 | 4 | 3 | 3 |
| 7 | 1 | 14 | 3 | 4 | 4 | 5 |
| 8 | 1 | 14 | 3 | 4 | 4 | 5 |
| 9 | 0 | 0 | 1 | 1 | 1 | 1 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 1 | 1 | 1 | 1 |

**Table II**

Research Priorities of Preservice Elementary Teachers by Gender

| Ranking | Male (n = 7) Item | % | Female (n = 79) Item | % | Total (n = 86) Item | % |
|---|---|---|---|---|---|---|
| | | | Highest Priorities | | | |
| 1 | 1 | 100 | 1 | 95 | 1 | 95 |
| 2 | 19 | 100 | 3 | 95 | 3 | 95 |
| 3 | 2 | 86 | 19 | 89 | 19 | 90 |
| 4 | 3 | 86 | 11 | 86 | 11 | 86 |
| 5 | 10 | 86 | 20 | 86 | 20 | 86 |
| 6 | 16 | 86 | 21 | 86 | 21 | 86 |
| 7 | 27 | 86 | 12 | 85 | 12 | 83 |
| 8 | 18 | 86 | 26 | 85 | 8 | 80 |
| 9 | 20 | 86 | 8 | 81 | 26 | 80 |
| 10 | 21 | 86 | 4 | 81 | 4 | 79 |
| | | | Lowest Priorities | | | |
| 23 | | | | | 16 | 61 |
| 24[b] | | | 16 | 59 | 23 | 61 |
| 25 | 5 | 43 | 15 | 57 | 13 | 56 |
| 26 | 15 | 43 | 13 | 55 | 15 | 56 |
| 27 | 26 | 43 | 5 | 47 | 5 | 47 |
| 28 | 24 | 29 | 24 | 39 | 24 | 38 |

[a]Percentage of teachers rating an item 1 or 2 on priority scale.

[b]Four of the remaining thirteen items fall here; therefore, only four were included in the McNemar analysis.

Note. Horizontal marks on the vertical line indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

**Table III**
Research Priorities of Preservice Elementary Teachers

According to Grade Categories

| Ranking | K-4 (n = 68) Item | % | 5-8 (n = 18) Item | % |
|---|---|---|---|---|
| | | Highest Priorities | | |
| 1 | 1 | 99 | 19 | 94 |
| 2 | 3 | 97 | 3 | 89 |
| 3 | 19 | 88 | 7 | 89 |
| 4 | 20 | 88 | 1 | 83 |
| 5 | 21 | 88 | 4 | 83 |
| 6 | 11 | 86 | 11 | 83 |
| 7 | 12 | 86 | 6 | 78[b] |
| 8 | 8 | 84 | 14 | 78 |
| 9 | 26 | 83 | 17 | 78 |
| 10 | 18 | 81 | 20 | 78 |
| 11 | | | 21 | 78 |
| 12 | | | 26 | 78 |
| | | Lowest Priorities | | |
| 24 | 16 | 58 | [c] | |
| 25 | 15 | 55 | | |
| 26 | 13 | 54 | 15 | 61 |
| 27 | 5 | 41 | 23 | 56 |
| 28 | 24 | 39 | 24 | 33 |

[a]Percentage of teachers rating an item 1 or 2 on priority scale.
[b]Twelve items were included in the highest priorities category because the ratings were identical for items 6, 14, 17, 20, 21, and 26.
[c]There were 5 items ranked 79%.

Note. Horizontal marks on the vertical line indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

**Table IV**
Research Priorities According to College

Science Courses Completed

| Ranking | 1-3 (n = 55) Item | % | 4-12 (n = 31) Item | % |
|---|---|---|---|---|
| | | Highest Priorities | | |
| 1 | 3 | 98 | 1 | 94 |
| 2 | 1 | 96 | 3 | 90 |
| 3 | 19 | 91 | 19 | 87 |
| 4 | 8 | 88 | 20 | 87 |
| 5 | 11 | 86 | 7 | 84 |
| 6 | 12 | 86 | 11 | 84 |
| 7 | 21 | 88 | 21 | 84 |
| 8 | 20 | 86 | 4 | 81 |
| 9 | 27 | 86 | 9 | 81 |
| 10 | 18 | 82[b] | 12 | 77 |
| 11 | 26 | 82 | | |
| | | Lowest Priorities | | |
| 24 | 16 | 63 | 15 | 52 |
| 25 | 9 | 60 | 25 | 48 |
| 26 | 15 | 59 | 24 | 45 |
| 27 | 13 | 57 | 5 | 45 |
| 28 | 5 | 48 | 23 | 42 |

[a]Percentage of teachers rating an item 1 or 2 on priority scale.

[b]Both items 18 and 26 were selected by 82% of this group.

TABLE V

Research Interests: Comparison of Preservice and Inservice Elementary Teachers

| Ranking | Male | | | | Female | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Preservice (n = 7) | | Inservice (n = 62) | | Preservice (n = 79) | | Inservice (n = 488) | | Preservice (n = 86) | | Inservice (n = 553)[c] | |
| | **Highest Priorities** | | | | | | | | | | | |
| | Item | %[a] | Item | % | Item | % | Item | % | Item | % | Item | % |
| 1 | 1 | 100 | 11 | 75.8 | 1 | 95 | 3 | 86.0 | 1 | 95 | 3 | 84.6 |
| 2 | 19 | 100 | 12 | 75.8 | 3 | 95 | 4 | 82.1 | 3 | 95 | 4 | 80.9 |
| 3 | 2 | 86 | 3 | 72.6 | 19 | 89 | 1 | 74.8 | 19 | 90 | 1 | 74.1 |
| 4 | 3 | 86 | 4 | 72.6 | 11 | 86 | 11 | 72.3 | 11 | 86 | 11 | 72.7 |
| 5 | 10 | 86 | 1 | 67.2 | 20 | 86 | 12 | 71.4 | 20 | 86 | 12 | 71.7 |
| 6 | 13 | 86 | 2 | 64.5 | 21 | 86 | 20 | 70.7 | 21 | 86 | 20 | 69.9 |
| 7 | 27 | 86 | 14 | 63.9 | 12 | 85 | 14 | 69.5 | 12 | 83 | 14 | 68.8 |
| 8 | 18 | 86 | 20 | 63.9 | 26 | 81 | 27 | 65.1 | 8 | 80 | 27 | 64.8 |
| 9 | 20 | 86 | 5 | 62.9 | 8 | 81 | 9 | 64.8 | 26 | 80 | 9 | 63.7 |
| 10 | 21 | 86 | 27 | 62.9 | 4 | 81 | 2 | 62.5 | 4 | 79 | 2 | 62.5 |
| | **Lowest Priorities** | | | | | | | | | | | |
| 23 | | | | | | | | | 16 | 61 | | |
| 24[b] | | | 15 | 33.9 | 16 | 59 | 16 | 34.7 | 23 | 61 | 16 | 35.5 |
| 25 | 5 | 43 | 26 | 32.3 | 15 | 57 | 23 | 32.7 | 13 | 56 | 15 | 33.0 |
| 26 | 15 | 43 | 23 | 30.6 | 13 | 55 | 15 | 32.5 | 15 | 56 | 23 | 32.5 |
| 27 | 26 | 43 | 13 | 30.6 | 5 | 47 | 13 | 30.6 | 5 | 47 | 13 | 30.8 |
| 28 | 24 | 29 | 24 | 19.4 | 24 | 39 | 24 | 21.1 | 24 | 38 | 24 | 21.0 |

[a]Percentage of students rating an item 1 or 2 on priority scale.
[b]Four of the remaining thirteen items fall here; therefore, only four were included in the McNemar analysis.
[c]47.2% of the teachers had 16+ years of teaching experience.

Note. Horizontal marks on the vertical line indicate that the percentage is significantly different at least at the 0.05 level from the percentage given where the line begins.

| Inservice (Gabel et al.) | Preservice (Bitner) |
|---|---|
| **Top 10** | |
| Hands-on (#3) | Cognitive development and Learning Styles (#1) |
| Science Content in Curriculum (#4) | Hands-on (#3) |
| Cognitive Development and Learning Styles (#1) | Slow Learners (#19) |
| Problem Solving (#11) | Problem solving (#11) |
| Teaching Strategies (#12) | Gifted children (#20) |
| Gifted Children (#20) | Interdisciplinary teaching of science with mathematics and language arts (#21) |
| Sequencing of Science Content (#14) | Teaching strategies (#12) |
| Barriers to Teaching Science (#27) | Science learning centers (#8) |
| Effective Printed Materials (#9) | Disadvantaged children (#26) |
| Science Classroom Experiences and Pupil Attitudes (#2) | Science content of the curriculum (#4) |
| **Bottom 5 or 6** | |
| Role Model and Science Careers (#16) | Role models and science careers (#16)<br>Science fairs (#23) |
| Language Difficulties (#15) | Misconceptions (#13) |
| Science Fairs (#23) | Language difficulties (#15) |
| Misconceptions (#13) | Specialized science teachers and facilities (#5) |
| Sex Differences (#24) | Sex differences (#24) |

Fig. 1 **Comparison of Interests: Preservice and Inservice Teachers**